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FAILURE MODES EFFECTS ANALYSIS (FMEA) -- CRITICAL HARDWARE

NUMBER: M7-3A-E7-X

SUBSYSTEM NAME: TUNNEL ADAPTER - ECLSS

REVISION: 1 10/22/92

PART NAME VENDOR NAME PART NUMBER VENDOR NUMBER

■ LRU : VALVE AND CAP

ME284-0542-0001

## PART DATA

- EXTENDED DESCRIPTION OF PART UNDER ANALYSIS: SPACELAB DUCT ISOLATION VALVE
- | = QUANTITY OF LIKE ITEMS: 1 ONE VALVE & ONE CAP
  - FUNCTION:

PROVIDES THE CAPABILITY TO ISOLATE THE TUNNEL ADAPTER FROM THE SPACELAB ATMOSPHERE. THIS ALLOWS DEPRESSURIZATION OF THE TUNNEL ADAPTER FOR EVA. OR FLYING WITH TUNNEL INSTALLED BUT SPACELAB DISCONNECTED. CAP PROVIDES ISOLATION REDUNDANCY. CAP IS NORMALLY INSTALLED FOR ASCENT/ ENTRY AND INSTALLED BY EVA CREWMAN PRIOR TO DEPRESSURIZATION OF THE TUNNEL ADAPTER.

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FAILURE MODES EFFECTS ANALYSIS (	(FMEA)	- CRITICAL FAILL NUMBER	JRE MODE 1: M7-3A-E7-01
SUBSYSTEM: TUNNEL ADAPTER - E LRU: VALVE AND CAP ITEM NAME: VALVE AND CAP	ECLSS		1 10/22/92 R  CRITICALITY OF THIS FAILURE MODE:1/1
m FAILURE MODE: EXTERNAL LEAKAGE, VALVE			
MISSION PHASE: 00 ON-ORBIT			
■ VEHICLE/PAYLOAD/KIT EFFECTIVITY	: ID3	DISCOVERY ATLANTIS	
E CAUSE: MECHANICAL SHOCK, VIBRATION, CO CRITICALITY 1/1 DURING INTACT A REDUNDANCY SCREEN A) N/A B) N/A C) N/A			POROSITY.
PASS/FAIL RATIONALE:		-	
<b>■</b> B)			
■ C)			
- FAILUI	RE EFFEC	TS -	
■ (A) SUBSYSTEM: INABILITY TO ISOLATE TUNNEL ADAPTER FROM SPACELAB ATMOSPHERE.			
<ul> <li>(B) INTERFACING SUBSYSTEM(S): DECREASED AIRFLOW TO SPACELAB. INCREASES. EXCESSIVE LOSS OF CO.</li> </ul>	SPACELAS	B PPOZ DECREASES	AND TEMPERATURE

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- (C) MISSION: POSSIBLE EARLY MISSION TERMINATION.
- (D) CREM, VEHICLE, AND ELEMENT(S):

  POSSIBLE LOSS OF CREWMEN IF CONTINGENCY EVA IS REQUIRED AND TUNNEL

  CANNOT BE REPRESSURIZED FOR RETURN TO CABIN (EVA CREWMEN MUST REMAIN IN

  AIRLOCK UNTIL LANDING).
- = (E) FUNCTIONAL CRITICALITY EFFECTS:
  NONE
   DISPOSITION RATIONALE -
- (A) DESIGN:

  THE ISOLATION VALVE IS A MANUALLY OPERATED BUTTERFLY VALVE WITH POSITIVE LOCKING IN THE FULL OPEN AND FULL CLOSED POSITION. THE BUTTERFLY VALVE HAS SILICONE LIP SEAL MOLDED DIRECTLY TO THE PERIMETER OF THE VALVE PLATE, WHICH PROVIDES A CONTINUOUS UNBROKEN GAS SEAL ACROSS THE EDGE OF THE VALVE. VALVE BODY IS ALUMINUM WHICH HAS TEFLON IMPREGNATED HARD COAT APPLIED TO THE VALVE BORE SEATING AREA; MAXIMUM CORROSION RESISTANCE WITH MINIMUM COEFFICIENT OF FRICTION.
- (B) TEST:

  QUALIFICATION TESTS FOR 10D MISSION LIFE: ACCELERATION OF 5 G FOR FIVE MINUTES PER AXIS. SINUSCIDAL VIBRATION Ø 5-35 HZ AT AN ACCELERATION AMPLITUDE OF +- 0.25 G PEAK PER AXIS. RANDOM VIBRATION AT THE RATE OF 6 DB/OCTAVE FROM 20-150 HZ, CONSTANT AT 0.03 G2/HZ FROM 150-1000 HZ, AND DECREASING AT 6 DB/OCTAVE FROM 1000-2000 HZ FOR A TOTAL DURATION OF 48 MINUTES PER AXIS. DESIGN SHOCK Ø 20 G PER AXIS. OPERATING LIFE OPERATED OPEN/CLOSED POSITIONS WITH PRESSURE OF 14-16 PSIG APPLIED FOR 600 CYCLES.

ACCEPTANCE TEST - THE VALVE WAS PROOF PRESSURE TESTED AT 24 PSIG FOR 5 MINUTES WITH VALVE OPEN AND CLOSED. INTERNAL LEAK CHECK AT 16 PSI; 5 SCCM MAX.

- OMRSD: EXTERNAL LEAK TEST WITH CAP INSTALLED AND VALVE OPEN AT 16-18 PSIG: LEAK RATE 15 SCCM MAX.
- C) INSPECTION: RECEIVING INSPECTION MATERIALS VERIFIED AT RECEIVING INSPECTION.

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## FAILURE MODES EFFECTS ANALYSIS (FMEA) — CRITICAL FAILURE MODE NUMBER: M7-3A-E7-01

CONTAMINATION CONTROL CORROSION PROTECTION PROVISIONS AND CONTAMINATION CONTROL PLAN VERIFIED BY INSPECTION. CLEANLINESS LEVELS OF 300A.

ASSEMBLY/INSTALLATION
MANUFACTURING PROCESSES, INSTALLATION AND ASSEMBLY VERIFIED BY
INSPECTION. DIMENSIONAL CHECKS PERFORMED BY INSPECTION. VISUAL
INSPECTION USING 10X MAGNIFICATION ON SEAL RING VERIFIED BY INSPECTION.

CRITICAL PROCESSES
PASSIVATED PARTS VERIFIED BY INSPECTION. SPECIAL TEFLON IMPREGNATED ANODIZATION (NITUFF) VERIFIED BY INSPECTION.

TESTING ATP VERIFIED BY INSPECTION.

HANDLING/PACKAGING PARTS PROTECTION VERIFIED BY INSPECTION.

- (0) FAILURE HISTORY: NO FAILURE HISTORY.
- (E) OPERATIONAL USE: NONE

- APPROVALS 
RELIABILITY ENGINEERING: H. M. TO

DESIGN EYGINEERING : S. CASTILLO :

QUALITY ENGINEERING : M. SAVALA
NASA RELIABILITY :
NASA SUBSYSTEM MANAGER :
NASA QUALITY ASSURANCE :
EDITORIALLY APPROVED : RI
EDITORIALLY APPROVED : JSC
TECHNICAL APPROVAL : VIA CR

12/17/92